Virginia's Next Generation 9-1-1 Implementation Plan

Presented to the E-911 Services Board

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Introduction

The ability of Virginians and those visiting this great Commonwealth to reach 9-1-1, the national number recognized for emergencies, from any available and marketed communications device utilizing today's capabilities of transmitting text, pictures and video, is non-existent. In Virginia, and throughout our nation, text messaging and instant messaging are becoming more common methods of communicating than traditional two-way voice communication. Pictures and videos are increasingly shared through the use of smart phones. Video and text based communications are now the norm for the deaf and hard of hearing. However, in what can be described as the era with the most rapidly advancing communications environment ever, 9-1-1 in Virginia is being left behind. The result of this situation will impact the Commonwealth's ability to serve its citizens through reduced capability.

Yet, with all of these advancements in consumer communications technology, Virginia's legacy 9-1-1 system cannot accept nor deliver any of this information to 9-1-1 Call Centers, also known as Public Safety Answering Point (PSAPs). The architecture of the legacy 9-1-1 system is based on analog telephony designed to enable voice communication to 9-1-1, not data. As a result, Virginia 9-1-1- Call Centers have, in most cases, no ability to receive, transmit, display, process, and share vital information about 9-1-1 calls; subsequently impacting the level of 9-1-1 emergency services that Virginia citizens receive.

Currently, Virginia's 9-1-1 emergency communications system is managed and coordinated locally, relying on standard wireline voice communications that is available with analog telephony. The current architecture that supports these locally-based services is nine, independent analog networks, which rely upon forty-year old technology. This current stove-piped configuration is a myriad of closed systems, which result in a duplication of services, as well as a lack of interoperability among the networks.

By developing a statewide Internet Protocol (IP)-based communications system that would support Next Generation 9-1-1 (NG9-1-1)[1], the Commonwealth would be able to overcome the limitations of an outdated 9-1-1 infrastructure and better serve Virginia citizens. A consistent level of 9-1-1 services and efficiencies should be the goal across the Commonwealth. At a minimum, this type of communications backbone would enable 9-1-1 Call Centers to receive and transmit not just voice, but also images, video, or virtually any type of data. And when considering the aggregated benefits of this new technology from a Commonwealth perspective, NG9-1-1 enables the following:

- Allows 9-1-1 to adapt more quickly and more cost effectively to new technologies;
- Supports a data-rich environment in which 9-1-1 Call Centers have greater access to critical information in support of public safety systems and in meeting citizen expectations, thereby better assisting citizens and first responders in emergency situations;
- Permit greater data bandwidth over an IP network to foster data sharing among 9-1-1 Call Centers; and

[1] NG9-1-1 is an IP-based system comprised of managed IP-based networks (ESInets), functional elements (applications), and databases that replicate traditional E9-1-1 features and functions and provide additional capabilities. NG9-1-1 is designed to provide access to emergency services from all connected communications sources, and provide multimedia data capabilities for 9-1-1 Call Centers and other emergency service organizations.

- Allow greater flexibility in transferring calls in call overload or interoperable emergency situations.

As such, these benefits that NG9-1-1 will offer are not just infrastructure, but rather are the applications and services critical to the realization of a 9-1-1 backbone that can support today's applications utilizing voice, video, picture and data. This includes the necessity to update Customer Premise Equipment (CPE) at the local level to which a NG9-1-1 infrastructure will deliver the call for help for processing.

The result is greater efficiencies for the Commonwealth through an interconnected network structure that can support today's technologies and 9-1-1 Center capabilities. This interconnected structure will join together distributed regional networks into a single seamless statewide network. Connectivity will exist between and among the 9-1-1 Call Centers connected to the regional networks. The result of this network structure will be the ability to transfer a 9-1-1 call from one 9-1-1 Call Center to any other 9-1-1 Call Center in the Commonwealth.

This new interconnected network structure will translate into reduced cost and variability for the 9-1-1 Call Centers through the consolidation and sharing of applications and services and the standardization of data and connectivity components. For example, the mapping services that 9-1-1 Call Centers utilize to locate a 9-1-1 caller could consume standardized statewide Geographic Information Systems (GIS) data, eliminating the duplication of data by state and local governments. And, a Computer Aided Dispatch (CAD) application could be hosted remotely and accessed by 9-1-1 Call Centers through an IP backbone, allowing localities the opportunity to share multi-user applications instead of supporting multiple stand-alone applications.

However, the most important and critical component of 9-1-1 is the human factor. Without recognizing the need and providing for adequate staffing with trained and experienced individuals to process and manage a wide array of communication pathways, any update to infrastructure or added capabilities will tax a specialized workforce that is already stretched very thin. The human factor must be considered in relation to NG9-1-1, well in advance of any deployment of new technology. This will enable localities that support direct 9-1-1 services to their communities to meet staffing demands, while ensuring that a competent and effective workforce is available.

Purpose of the Plan

This Plan is intended to be a guide for Virginia's 9-1-1 leaders and government officials who will be responsible for insuring that the necessary actions are taken to transition an antiquated system to a statewide NG9-1-1 system. The long-term goal for Virginia's NG9-1-1 system is a shared infrastructure, which will be comprised of 9-1-1, and other emergency services entities that can leverage this overall system. However, this long-term goal is dependent upon the completion of a wide variety of standards. Many of these standards already exist, and many are actively under development, but until all of the necessary standards have been completed, decisions related to actual NG9-1-1 technological solutions should be postponed. Instead, Virginia 9-1-1 leaders and government officials should focus on the critical planning objectives that should precede any technological decisions.

As a result, the focus of this plan is on the short-term, specifically on the following critical prerequisites:

- Establishing a governance model;
- Locating initial and sustainable funding;

- Identifying necessary technical and operational standards; and,
- Investigating the impact of NG9-1-1 on Public Safety Communications personnel.

Once these initial considerations have been addressed, planning can then move on to subsequent phases, such as the technology specifications, system operations, and contractual decisions. In the meantime, while critical planning efforts are underway, the Commonwealth will have an opportunity to educate Public Safety Communications personnel and local government leaders about NG9-1-1.

Currently, this planning initiative is being led by the E9-1-1 Services Board and the Virginia Information Technologies Agency's (VITA's) Public Safety Communications (PSC) Division, concurrent with stakeholders and subject matter experts in 9-1-1 from across the Commonwealth. This Plan includes a comprehensive NG9-1-1 vision, which describes an end-state that all 9-1-1 Call Centers can obtain, as well as the strategic NG9-1-1 goals that need to be achieved to overcome identified gaps from the following components: statutory/regulatory, governance, coordination, funding, infrastructure, 9-1-1 operations, confidentiality, and liability.

Development of the Plan

In July 2011, an Initiative Action Team (IAT) was formed with members from the Public Safety Communications community. This Team, in partnership with PSC staff, was tasked by the E-911 Services Board with developing a NG9-1-1 vision and implementation strategy to migrate Virginia 9-1-1 Call Centers from their legacy analog environment to an IP-based future. Members of the IAT participated in workgroups to analyze the strengths, weaknesses, opportunities, and threats of the strategic areas mentioned above. They presented their findings in bi-monthly conference calls and online meetings. These analyses are available from this link: http://www.vita.virginia.gov/isp/ default.aspx?id=14864. The purpose of these analyses was to first articulate next steps and priorities to overcome identified gaps. The second step was to develop strategic goals and an implementation framework for NG9-1-1 in Virginia. These goals and framework are included in this document.

NG9-1-1 Vision and Core Components

Virginia will have an integrated statewide NG9-1-1 system that enables seamless 9-1-1 communications through an infrastructure of distributed regional networks, supported by a specialized workforce.

This vision is sustained by the following four core components:

- Distributed regional networks
- Applications
- 9-1-1 Call Center equipment, software, and services
- Public Safety Communications personnel

Distributed regional networks

In the NG9-1-1 emergency communications system, the existing duplicitous architecture would be replaced with a single and much larger system. In this system, a standardized set of IP-technologies and applications will be used to route a 9-1-1 call through internet traffic, providing intelligent routing and location information, and call signaling[2]. These calls will be delivered to an Emergency Services Internet Protocol Network (ESInet)[3], which can receive calls from a variety of sources, including both IP and legacy 9-1-1 service providers.

There are two key aspects to the deployment of ESInets: (1) the physical build out and coverage of ESInets and (2) the management and coordination of ESInets. In Virginia, NG9-1-1 will be delivered through a "system of systems" approach. The framework for this approach will be an interconnected and seamless statewide ESInet that includes regional ESInets. These regional ESInets would be configured locally and would provide connectivity to all 9-1-1 Call Centers in designated regions. Localities and regions will continue to have a primary role in emergency response; however, the technical architecture of Virginia's NG9-1-1 system will require state-level coordination of ESInets.

Furthermore, all forms of voice, video, and data delivered to 9-1-1 Call Centers via an ESInet could also be shared with additional responders and emergency response entities through IP-based voice, data, and picture and video applications. Eventually, by utilizing this approach, this system could be leveraged to include or provide back-up capabilities to general government, private sector entities, and other public safety services and agencies.

Applications

The distributed ESInet described above, at a minimum, will provide access to numerous application layer services that will support interoperability among the regional networks. These must include standardized core services such as GIS-based directories of authorized organizations and resources, and access control/identify management for implementation of information sharing. Eventually, applications may include hosted solutions for local 9-1-1 Call Center equipment, software, and related services. The recommendation is for state-level management of NG9-1-1 infrastructure applications to ensure adherence to appropriate standards and the achievement of anticipated economies of scale and efficiencies.

Given the potential complexity for negotiating NG9-1-1 services, core 9-1-1 components, such as Automatic Number Identification (ANI), Automatic Location Identification (ALI), and Selective Routing (SR), should be centrally procured and funded for 9-1-1 Call Centers transitioning to NG9-1-1. The Commonwealth would determine what the appropriate NG9-1-1 services would be to deliver the core 9-1-1 components and would provide these services, through a statewide contract, to the 9-1-1 Call Centers. This approach would ensure standardization regarding NG9-1-1 services that will rely upon fundamental data elements. Other NG9-1-1 services and components will be available, but localities would need to determine if they are needed, and pay for these additional items themselves.

[2] Call signaling is the process that is used to set up a connection in a telephone network. In an IP network, call signaling establishes a connection between two endpoints on the network.

[3] An ESInet is designed as an IP-based inter-network (network of networks) shared by agencies which may be involved in any emergency.

9-1-1 Call Centers that are early adopters of NG9-1-1 technology, and are already receiving NG9-1-1 services that provide 9-1-1 core components, must be included in any negotiated statewide contract if the greatest possible cost efficiencies are to be achieved. The Commonwealth will need to include provisions for early adopters during contract negotiations with service providers.

9-1-1 Call Center equipment, software, and services

Locally managed Virginia 9-1-1 Call Centers would be responsible for procuring their own equipment, software, and services, as well as be responsible for the associated costs; however, there must be some mechanism in place to assist in funding these upgrades. This "mechanism for funding" could feasibly be greatly supported by surcharges and taxes already in place; however, the amounts of these funding streams, designed specifically in support of 9-1-1, have not always been reliable. Moving forward, statewide procurement strategies and hosted solutions must be explored to help minimize the cost for state and local government.

Public Safety Communications personnel

The success of deploying NG9-1-1 in Virginia is predicated upon having adequately trained and available Public Safety Communications personnel. Local government officials must recognize and ensure adequate staffing levels are provided for a very specialized workforce to carry out and meet the demands this technology will bring. The costs associated can and should be supplemented through those mechanisms of funding identified above. Training requirements for NG9-1-1 must be established and implemented well in advance of any deployment of new technology.

Strategic Goals

The strategic goals represent the first steps in facilitating Virginia's move towards the NG9-1-1 vision described in the previous section.

Goal 1: Create a comprehensive NG9-1-1 and emergency communications governance model

The deployment of NG9-1-1 in Virginia will be dependent upon a cohesive and robust governance model, which at a minimum, should provide for the following:

- A designated 9-1-1 entity with the authority and responsibility for comprehensive statewide NG9-1-1 coordination;
- Widespread stakeholder participation in NG9-1-1 planning and implementation;
- Incentives to facilitate working relationships between the 9-1-1 community and groups within the state that interact with 9-1-1; and,

- Resource sharing through multi-jurisdictional agreements for efficiency and affordability.

9-1-1 is a complex system that necessitates leadership among the diverse and potentially competing stakeholder community. The focus of this leadership must be on governance and coordination since all other responsibilities, including funding, are subordinate to this primary function. The recommended governance model is a single statewide entity, whose primary responsibility is to coordinate the efforts of all appropriate agencies/entities during the transition from legacy to NG9-1-1 and beyond. Virginia Code has designated the E-911 Services Board as the current 9-1-1 governance entity.

The increased information sharing capabilities of NG9-1-1 means that the 9-1-1 and emergency communications systems will be much more interrelated in a next generation environment, calling for more coordinated and cooperative governance of the entire emergency communications enterprise. However, even though there are other governance entities in the Commonwealth focusing on communications and interoperability planning, the E-911 Services Board remains the most appropriate governance entity for NG9-1-1 for the following reasons:

- Expertise and historical knowledge to manage an overall statewide 9-1-1 system
- Currently responsible for 9-1-1 support and coordination
- Established relationship with the 9-1-1 Call Center community and local governments

Therefore, the recommendation is to leverage this existing 9-1-1 governance model and expand the coordinating responsibilities of the E-911 Services Board. Expansion of governance and coordination should only occur where there are gaps in the oversight of critical responsibilities. This coordination, which is directly related to NG91-1, must be comprehensive and should include the appropriate aspects of statewide planning, funding, stakeholder involvement, enforcement of uniform statewide technical and operational standards, policy creation and rulemaking for the stakeholders' benefit, public education, Public Safety Communications personnel training, procurement, grant management, and program evaluation.

Decision-making, absent broad-based stakeholder input, will increase costs, decrease desirable outcomes, and delay implementation of NG9-1-1. To avoid these occurrences, two things need to occur. One, 9-1-1 stakeholders must be adequately represented at every stage during the transition to NG9-1-1 to ensure the critical input of stakeholder needs. And two, 9-1-1 Call Centers and local governments must work with other state and local agencies to foster efficiency and affordability when provisioning NG9-1-1 services.

Incentivizing collaboration among regions and between the state and regions can be achieved, where feasible, with resource sharing to reduce per capita costs (e.g. staff, equipment, contracts, and facilities) through multi-jurisdictional agreements. Resource sharing increases efficiency, effectiveness, and cost control among jurisdictions and will contribute to the sustainment of NG9-1-1. As a result, incentives for collaboration and means to achieve this collaboration must be provided for in the NG9-1-1 governance model.

Goal 2: Develop a legislative and regulatory agenda to facilitate the Commonwealth's NG9-1-1

Due to the required interconnectivity among local, regional, and interstate systems, the state's role is expected to increase in a NG9-1-1 environment. A uniform and suitably broad definition of a "9-1-1 call" will need to be established to ensure that all types of information that may make up a 9-1-1 request for assistance is accounted for to maintain appropriate levels of confidentiality and minimize liability. The need for accuracy and system functionality will drive this increased role, as well as the need to minimize duplication of efforts and the use of public funds. The most cost effective solution would be for the Commonwealth, rather than the localities, to address confidentiality and liability as a requirement of the statewide NG9-1-1 system itself.

Quality of service and efficiency related to 9-1-1 call processing in Virginia will improve with NG9-1-1 as a result of increased access to resources and cooperation/collaboration with other states, federal agencies, as well as tribal, international and private entities. As NG9-1-1 moves into the forefront, the ability for public and private entities to work together to achieve a common goal will be increasingly important given the cost burden related to NG9-1-1. As a result, working cooperatively is cost effective and efficient for the deployment of NG 9-1-1. This strategy will also enable Virginia to better leverage industry expertise.

With NG9-1-1, there will be a more pronounced role for the Commonwealth in procuring and operating components of a statewide infrastructure. Currently in Virginia, the definition and procurement of 9-1-1 services occurs through a tariffed structure. However, NG9-1-1 is an entirely different concept because 9-1-1 services will be defined through standards and the procurement of these services will be obtained in a competitive market. The result of these changes will be a marked difference between operating statewide and regional systems as compared to individual 9-1-1 components.

The following are examples of the legislative/regulatory issues that should be addressed:

- Legislation/regulations concerning the eligible use of 9-1-1 funds.
- Provisions that require specific technology components for legacy 9-1-1 service delivery that are not necessarily the same for NG9-1-1.
- Legislation which may inhibit appropriate and efficient information sharing of 9-1-1 data with appropriate safeguards for privacy protection.
- Existing 9-1-1 service arrangements and tariffs which may inhibit new entrants from making NG9-1-1 competitive services available on a component by component basis, where technically and operationally feasible.
- Uniform requirements for all 9-1-1 System Service Providers (SSPs) to meet accepted industry standards.

In summary, the Commonwealth's NG9-1-1 legislative agenda should include the following objectives:

- A statutory environment that authorizes the operation of a NG9-1-1 system and a regulatory framework that provides for a competitively neutral marketplace.
- Private and public cooperation in providing NG9-1-1 services.
- Open and competitive procurement of 9-1-1 services.

Goal 3: Provide dedicated and sustainable funding for NG 9-1-1 and Legacy 9-1-1

The funding mechanism used to provide dedicated and sustainable funding for NG9-1-1 and legacy analog 9-1-1 should be technology-neutral and allow for capital and operational expenditures. In addition, surcharge money dedicated to 9-1-1 should only be used for 9-1-1 purposes and there should be a means of adjusting the revenue stream as conditions change. The Commonwealth has an existing statewide communication funding mechanism, the Communications Use and Sales Tax Act Trust Fund, which may also be a potential funding source. However, in order to be successful, NG9-1-1 will require two things: one, additional funding specifically dedicated to NG9-1-1; and two, an increase in the current level of local funding to sustain existing 9-1-1 technologies.

Regardless of the funding mechanism, the funding source should be sufficient to cover the cost elements related to the transition to NG9-1-1. These cost elements are as follows:

- Initial costs
- Transitional recurring costs
- NG9-1-1 recurring costs
- 9-1-1 Call Centers operational and personnel costs

The Commonwealth's strategic plans, especially those related to communications, should promote state-level funding for IP-based emergency communications, including NG9-1-1. Initial costs represent the smallest cost category and generally consist of one-time, nonrecurring costs associated with converting to a NG9-1-1 network.

Transitional recurring costs are defined by existing tariffs that support the legacy analog 9-1-1 environment and legislation that provides for wireless 9-1-1 cost recovery. These recurring costs will decrease as Virginia transitions to NG9-1-1, but they will continue to be a cost burden for the Commonwealth and localities as long as the tariffs and cost recovery remain in effect.

NG9-1-1 recurring costs represent the new network costs associated with NG9-1-1. This cost element has the potential to be an insurmountable fiscal barrier since these costs will far exceed any cost savings recognized from the decrease in transitional recurring costs. If the tariffs that support the legacy analog 9-1-1 environment and legislation that provides for wireless 9-1-1 carrier cost recovery were eliminated, the additional funding should be redirected to support NG9-1-1. Local and state funding, made available as a result of these changes, must be earmarked for NG9-1-1, and may necessitate the establishment of an Enterprise Fund, or other saving mechanism, to ensure sufficient funding when needed.

And finally, the impact of NG9-1-1 on 9-1-1 Call Centers operational and personnel costs may be a catalyst for 9-1-1 Call Center consolidations. Localities may choose to consolidate current 9-1-1 Call Center operations with other localities to help reduce the future cost burden of NG9-1-1 where feasible.

Implementation Framework

The VITA PSC Division will provide oversight of the NG9-1-1 Implementation Plan and provide overarching project management for the implementation steps listed below. The first category contains critical tasks to be included in the NG9-1-1 legislative agenda for the 2013 General Assembly. The

timeline for completing these items is September 2012. The second category contains tasks that have a longer timeframe or need to begin after the NG9-1-1 legislative agenda has been finalized. The timeline for completing these items is July 2013.

Implementation Steps

The timeline for completing these deliverables is September 2012.

1. Develop educational and outreach material for regulators, legislators, agencies, and municipal bodies to ensure that they have the requisite understanding of NG9-1-1 technology.

2. Develop planning guidelines for 9-1-1 Call Centers that discusses why individual 9-1-1 Call Centers should participate in a statewide NG9-1-1 system and what the benefits will be.

3. Create the governance structure for the E-911 Services Board, which will be responsible for the coordination, oversight, and/or management of the NG9-1-1 system.

4. Review and analyze existing legislation and regulations, including those related to confidentiality and liability, to determine which ones may inhibit the evolution of NG9-1-1 technology and include change recommendations in the FY 2012 E-911 Services Board's Annual Report.

5. Establish estimates for the cost elements associated with the statewide migration to NG9-1-1, estimate any potential cost savings, and develop a proposed funding plan, including suggestions for additional revenue through current telecommunications funding sources and/or the removal of transfers from the Wireless E-911 Services Fund.

The timeline for completing these deliverables is July 2013.

6. Identify appropriate and necessary standards and guidelines related to the functional components of the NG9-1-1 system and work with the appropriate emergency communication stakeholders to develop. Given the breadth and complexity of these types of standards, the recommendation is for a separate Initiative Action Team to focus on this effort comprised of 9-1-1 stakeholders and subject matter experts.

7. Identify the potential staffing implications and training requirements NG9-1-1 will have on the Commonwealth's 9-1-1 specialized, understaffed and overly-taxed workforce. The recommendation is for this task to be included in the Initiative Action Team focused on the recruitment and retention of Public Safety Communications Personnel.

Conclusion

The opportunity to upgrade our existing 9-1-1 communications system is not merely a compelling opportunity, but an imperative given the limitations of the current analog telephony. This document describes Virginia's implementation strategy for NG9-1-1 at a strategic level, but there is more work to be completed. The citizens of Virginia expect to be able to reach and communicate with 9-1-1 using an array of modern technologies and from adequately staffed 9-1-1 Call Centers. Given the strength of the case already provided, and the widespread awareness of the need to do so, there is little reason to delay in beginning the planning process for NG9-1-1.